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The purpose of this study was to determine the attitude towards pre-performance activity and the effect this attitude had upon the performance of the fifty-yard dash. Ninety-one ninth grade male physical education students served as subjects. Their attitudes towards pre-performance exercises were determined by the Smith-Bozymowski attitude inventory. They were classified as having favorable, unfavorable, or undecided attitudes for the analysis of data. There were two pre-performance conditions tested, warm-up and no warm-up. Each subject ran the fifty-yard dash under each pre-performance condition. The results showed the group with favorable and undecided attitudes had significantly better dash times. These two groups also performed significantly better when they were allowed to warm up.

THE EFFECT OF ATTITUDE TOWARD PRE-PERFORMANCE EXERCISES ON FIFTY-YARD DASH TIME

by

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

The value of physical activity prior to physical skill performance has long been a center of controversy. Pre-performance exercise, often referred to as warm-up, may involve calisthenics or skilled movements similar in nature to the movement patterns required in the actual physical performance. Perhaps the different results obtained through research are due to the type or length of the pre-performance activity utilized in the studies. It is possible that only certain types of physical performances are enhanced by pre-performance exercise. There is also the strong possibility that the attitudes of individuals towards pre-performance exercise (warm-up) may affect performance.

While teaching physical education to junior high school students, the writer became interested in the attitudes of ninth grade boys towards pre-performance exercise and its value in improving performance. Many of the boys felt their performance would not be up to par or that they might sustain an injury if they did not engage in some preliminary exercise. However, there were other students who felt pre-performance exercise was detrimental to performance. In their opinion it tired them out so that they could not perform up to normal expectations. In between these two extremes was a group who

did not care one way or the other about "warming-up." They could run an "all-out sprint" without any pre-performance exercise, or they could exercise ten minutes or more and still give an "all-out performance."

Purpose of Study

The purpose of the study was to determine the attitude of ninth grade boys towards pre-performance activity and the effect this attitude had upon their time performance in the fifty-yard dash.

Null Hypothesis

(1) There is no difference in the performance of the fifty-yard dash when preceded by warm-up.

(2) There is no difference among subjects with either favorable, unfavorable or undecided attitudes towards pre-performance exercise on fifty-yard dash times.

(3) There is no difference on the performance of the fifty-yard dash among subjects with favorable attitudes and warm-up, favorable attitudes and no warm-up, unfavorable attitudes and warm-up, unfavorable attitudes and no warm-up, undecided attitudes and warm-up, undecided attitudes and no warm-up.

(4) There is no difference between the scores on the first attitude test and the scores on the second attitude test.

Definition of Terms

Attitude will be defined as a behavorial pre-

disposition which will exert an enduring controlling influence over behavior. (18)

Pre-performance exercise will be defined as warm-up exercises.

Warm-up will be operationally defined as an activity or exercise which will begin the process of perspiration. (8)

Underlying Assumptions

(1) Each subject was persuaded and did, in fact, perform with an all-out effort in his participation in the study. (2) Attitude is a measurable variable. (3) The Smith-Bozymowski (35) attitude inventory is an acceptable, valid and reliable method of determining attitudes toward pre-performance exercise (see Appendix A page 43). The Likert technique was used in constructing the inventory. The inventory contains thirty-four questions of which each has a choice of five responses. They range from strongly disagree to strongly agree. The validity was checked by the Flanagan scale of discrimination. The reliability coefficient was found to be .94. (35) (4) The time allocated for the pre-performance exercise is of sufficient duration to produce a warm-up effect. (14,26,27)

Significance of the Study

Only three previous studies have attempted to control or investigate the very important psychological attitude variable as it relates to pre-performance exercise.

One study controlled the psychological variable by using hypnosis; another study chose to investigate the attitude by administering an opinionnaire before beginning the testing. This is an aspect of warm-up which warrants further study and was included in this study.

In several previous warm-up studies there have been relatively few subjects, therefore individual differences have not been sufficiently substantiated. Many studies have had fifty or less subjects and one had as few as four. This may be one reason for the contradictory findings in warm-up studies. The large sample in this study makes it unique in this regard.

Although many studies have been conducted concerning warm-up, there is still much controversy. The studies are not in agreement as to the effect of pre-performance exercise. Some studies have shown that pre-performance exercise benefits performance; others have reached the opposite conclusion that it is detrimental to performance, and the results of some studies show no significant difference. By attempting to account for previously neglected variables it is hoped that this research will make a significant contribution to the status of knowledge about pre-performance exercise.

CHAPTER II

REVIEW OF LITERATURE

Although many studies have been conducted concerning pre-performance exercise (warm-up), there is still much controversy. The results of the studies are not in agreement as to the effect of pre-performance exercise. Some studies have shown that pre-performance exercise benefits performance while others have shown that it is detrimental to performance. Other studies have produced results which show no significant difference between subjects that warm up and those that do not.

Devries (8) stated several reasons why appropriate pre-performance exercise might be beneficial. Warm-up may increase the speed of contraction and relaxation of muscles. It may lower the viscous resistance in the muscle. Hemoglobin and myoglobin give up oxygen much more rapidly at higher temperatures. Other physiological evidence supports warm-up on the basis that the stretching in most active warm-up will produce an accommodating effect on the Golgi Tendon organ and muscle spindle fibers.

Neuberger (25) found that between 1955 and 1968 there were twenty-two reports on pre-performance exercise in the literature. Sixty-four percent of these studies reported a significant increase in performance due to

pre-performance exercise. Only one percent reported a decrease in performance following pre-performance exercise, and the remaining thirty-five percent of the studies found no significant difference in performance following either pre-performance exercise or no pre-performance exercise.

Beneficial Significance

Asmussen and Boje[f] (1) in 1945 used four male subjects to study the effect of warm-up on the performance of work output on a bicycle ergometer. A passive warm-up and an active warm-up were used in their study. The passive warm-up consisted of taking a hot shower for ten minutes, the use of radio diathermy, and massage for ten minutes. The active warm-up consisted of thirty minutes of work on the bicycle ergometer. The two tests used were a measure of work output on the bicycle ergometer for power and endurance, and the strength of the calf at planter flexion. The results indicated that all warm-up except massage had a beneficial effect on performance. A given amount of work could be performed in a shorter length of time if the subject was warmed up. The harder the preliminary work, the better the performance that was of short duration. The results were significant at the .05 level of confidence.

Muido (24) in 1946 used both active and passive warm-ups to determine their effect on swimming performance. The passive warm-up consisted of taking a hot shower for

fifteen to eighteen minutes. The active warm-up consisted of a light workout in the gymnasium for ten minutes. The test was performed on the 50 yard crawl, 400 yard crawl and 200 meter breaststroke. The results were that the active and passive warm-up improved performance. The results were significant at the .05 level of confidence.

Lukes (20) studied the effects of warm-up on the amplitude of voluntary movement in 1954. The warm-up consisted of (1) side straddle hop, (2) right hand left toe touch, (3) leg raise up to stomach, (4) squat sit, (5) elbow flexion, (6) ankle joint exercise. The subjects consisted of twelve boys from physical education classes and four men. Lukes measured by degrees the angle of flexion, adduction, and abduction by a goniometer. It was found that warm-up increased the angle through which the joint moved. The results were significant at the .05 level of confidence.

Blank (3) investigated the effects of warm-up on speed in 1955. There were two groups tested. The highly skilled athletes performed significantly better on the 130 yard dash when allowed to warm up. The second group of subjects who were not highly skilled performed significantly better on the 100 yard dash when they warmed up. The level of confidence was .01.

Carlisle (5) studied the effect of warm-up on ten swimmers in 1956. The warm-up was of the passive type and consisted of a hot shower, as hot as tolerable for 1.8 and

2.6 minutes. The tests were to swim 220 yards and 40 yards as fast as possible. The results were that warm-up improved performance on both tests. These were significant at the .01 level of confidence.

Rochelle et al (30) in 1957 used seventy-seven men to study the effect of warm-up on the softball throw. Both informal and formal types of warm-up were used. The formal program consisted of throwing the softball from distances of 25, 50, 75, 100+ feet for one minute from each distance. The informal warm-up consisted of one minute each of toe touches, jumping jacks and alternate toe touches, plus two minutes of sprint running. The test was the softball throw for distance. The results were that the informal and formal improved performance to a significant extent at the .01 level of confidence.

Pacheco (27) investigated the improvement in jumping performance due to preliminary exercise in 1957. Ten subjects were used in testing the vertical jump. The warm-up program used consisted of isotonic stretching, running in place and knee bends. Performance was improved when preceded by warm-up. The results were significant at the .05 level of confidence. A second study was conducted using fifty men. Performance was once again improved when the vertical jumps were preceded by warm-ups. The warm-up used by the investigator was three minutes of spot running. One and a half minutes of rest were allowed before a set of five vertical jumps by a subject. The results were

significant at the .05 level of confidence.

Burke (4) in 1957, tested male college freshmen on strength, speed of movement, endurance, and accuracy to determine if these factors were affected by warm-up. The warm-up procedure used was bench stepping at three different cadences for three different time internals. The results were benefits to strength and no benefit to speed of movement, endurance, or accuracy. The level of significance was .05.

Thompson (38) used as subjects eighty-five males between the ages of seventeen to twenty-eight years old in 1958. The purpose of the study was to determine the effects of warm-up on five selected activities. These were speed and endurance swimming, accuracy in basketball foul shooting, accuracy in bowling, speed and accuracy in typing, and strength of softball players. The formal warm-up was practicing the skill that was to be performed. The informal consisted of a hot shower for three minutes, swimming, and calisthenics for five minutes. The results were that the formal warm-up improved the thirty yard swim and basketball foul shooting and accuracy and bowling. These results were significant at the .01 level. The informal had no effect on the performance of any of the activities.

Merlino (23) in 1959 investigated the influence of massage on the vertical jump. Thirty-six college men were used as subjects. The experimental conditions were (1) no warm-up, (2) a psychological control or placebo

control which emitted a sound. This sound was supposed to vibrate the leg muscles thus producing a warm-up effect. The third condition was the warm-up which consisted of ten minutes of deep stroking massage. The results showed a significant improvement at the .01 level of confidence in favor of warm-up.

Rochelle et al (31) in 1960 investigated the effect of incentive and preliminary exercise on performance. There were forty-six male subjects used, ages eighteen to twenty-two. The task was the softball throw for distance. The warm-up procedure was of the related type and consisted of five minutes total warm-up; one minute of throwing from five distances of 25, 50, 75, 100, and 100+ feet. The subjects were given a monetary reward for each throw that was greater than his average. The reward was even doubled if his first throw was the greatest distance. This was to try to control the psychological factor. The results showed that the throws did increase in distance from trials one to three when preceded by no warm-up, and did not increase in distance when preceded by warm-up. The trials preceded by warm-up were still 10.2 $\pm$ 1.65 feet farther than trials preceded by no warm-up. The results were significant at the .01 level of confidence.

Smith and Bozymowski (35) studied the effect of attitude towards warm-up on performance in 1965. Eighty-six female college women were used as subjects. They were given an attitude test to determine their attitude towards

warm-up prior to any motor performance. They were classified as having either an unfavorable or favorable attitude. A three-minute obstacle race was used to test motor performance. The warm-up period was three minutes in duration. The subjects ran the obstacle race with andwithout warming up. The results showed that the subjects who had a favorable attitude towards warm-up performed significantly better at the .01 level of confidence when allowed to warm up.

Richards (29) investigated the effect of the time of the warm-up on performance of the vertical jump. Eighty female subjects were used in the experiment and they were divided into four sub groups. The warm-up used was stool stepping for periods of either one, two, four, or six minutes. The vertical jump was then performed after these periods of warm-up. The results indicated that warm-up periods of one, and two minutes improved performance, and four minutes had no effect, but six minutes impaired performance. These results were significant at the .05 level of confidence.

Grodjinovsky and Magel (12) investigated the effect of warm-up on running performance in 1970. Thirteen male subjects participated in the experiment. The running tests were of distances of sixty yards, 440 yards and one mile. There were two types of warm-up used. The regular warm-up consisted of a set of calisthenics for eight minutes which included jumping jacks, side bends,

push-ups, sit-ups, toe touches, body rotations, body lunges and sitting toe touches. The vigorous warm-up consisted of all of the regular warm-up plus a one-tenth of a mile run (176 yards) at maximum speed. The results suggested that the regular and vigorous warm-up improved performance in the sixty and 440 yard runs, but not in the one mile run. These results were significant at the .05 level of confidence.

In 1971, Stern (36) studied the effect of warming up on high school distance runners. Twenty-seven high school distance runners ran six two-mile races. Three warm-up intensities were investigated. The first was no warm-up. The second intensity was a regular warm-up which consisted of two miles of easy jogging, short segments of pace running, four sets of two eighty-yard dashes, plus various stretching movements. The time for the regular warm-up was thirty minutes. The heavy warm-up consisted of stretching, vigorous calisthenics, two miles of easy jogging, two miles of faster running, eight sets of two eighty-yard dashes. The time for the vigorous warm-up was forty-five minutes. The subjects were divided into ability groups for analysis of the data. The results showed that the average and below average groups performed better with regular warm-up than they did with no warm-up or heavy warm-up. The high ability group performed best when their two-mile race was preceded by heavy warm-up. All results were significant at the .05 level of confidence.

In 1959 Pacheco (26) used 166 girls from the eighth and ninth grades to investigate the effect of warm-up exercises on the vertical jump. The type of warm-up used was three minutes of running in place, or hip mobilization, or deep knee bends. The performance was benefitted in this order: first, running in place; second, hip mobilization; and third, was deep knee bends. The results were significant at the .01 level of confidence.

Detrimental Significance

Emerson (10) in 1968 found warm-up to be detrimental to running performance. The running test was divided into four segments and the warm-up used was equal in time to the last three segments of the run. The results showed that both formal warm-up and general warm-up were detrimental to performance, but formal was more detrimental. The results were significant at the .05 level of confidence.

In 1964 Sedgwick and Whalen (32) investigated the effects of passive warm-up on muscle strength and endurance. There were actually two experiments conducted: one with twenty subjects and one with six subjects. The warm-up used was short wave diathermy. The results for both experiments were the same. Muscle strength was decreased by warm-up, and muscle endurance was not affected. The significant results were at the .05 level of confidence.

No Significant Difference

Hipple (14) studied the effect of warm-up on

junior high school boys in sprint running. In 1955 Hipple selected the best runners from his ninth grade physical education classes. They ran five sprints of fifty yards each. No warm-up was used before the first race. The first race would serve as the warm-up for the second race, and the first and second race would serve as the warm-up for the third race. This was the pattern until all five races had been run. There were five minutes of rest between runs. The results showed that ninety percent of the best times occurred in the first three trials, but no significant difference at the .05 level of confidence could be found in any of the first three trials. Slower speeds were realized on trials four and five but these times were attributed to fatigue.

Sills and O'Riley (33) investigated the effects of rest, exercise, and cold spray upon performance in spot running. In 1956 the investigators selected eighteen college men to test. The test was ten seconds of spot running followed by ten seconds of rest. One set was made of five of these trials. One set followed the other set. In between the two sets the experimental variables of rest, exercise, and cold spray were administered. The results of the second trial indicated that performance was improved by the cold spray more than by exercise or rest. The results were significant at the .05 level of confidence.

In 1956 Karpovick and Hale (17) conducted a series of three experiments to determine the effects of warm-up

upon physical performance. In the first experiment seven athletes performed sixty trials of the 440 yard run. There were three warm-up conditions investigated which were administered prior to the running. The warm-up was digital stroking, which was slow gentle rhythmic stroking covering the entire leg. This lasted for five minutes. The second warm-up was ten minutes of preliminary exercise. This was made of the 440 yard jog, sit ups and short sprints. The results of the experiment showed no significant difference at the .01 level of confidence in any of the three warm-up techniques.

In the second experiment five highly trained athletes were tested four times on the performance of the 440 yard dash. They ran twice after no warm-up and twice after digital stroking. The times after the digital stroking were not significantly better at the .05 level of confidence.

In the third experiment three subjects were used to investigate performance on the bicycle ergometer. A sprint ride was preceded by either no warm-up or warm-up. Their times were not significantly better at the .05 level of confidence.

Skubic and Hodgkins (34) in 1957 used thirty-one physical education women to investigate the effect of warm-up activities on speed, strength and accuracy. The subjects were divided into three near equal groups to test (1) speed ride of one-tenth of a mile on a bicycle ergometer, (2) the

maximum distance a softball could be thrown, (3) the number of foul shots that could be made out of ten attempts. The three pre-performance conditions were (1) no warm-up, (2) general warm-up, (3) related warm-up. The general warm-up consisted of participating in the activity that was to be performed for a short period of time. The results indicated that there was no significant difference at the .01 level of confidence, in any of the three sets of scores.

Grose (13) studied the effects of heat and cold upon muscle fatigue. In 1958 twelve male students were used as subjects. The task was to make thirty maximum contractions on a grip ergometer per minute for a period of six minutes. The pre-performance conditions were a (1) hot shower at forty-eight degrees centigrade for eight minutes, or (2) having the arm submerged in cold water ten degrees centigrade for eight minutes, or (3) massage for four minutes. The results were that the heat caused a decline in performance, the cold caused a greater decline, and the massage had no effect upon performance on the grip ergometer. The significant results were at the .01 level.

In 1959 Mathews and Snyder (22) studied the effects of warm-up on the 440 yard dash. Fifty males were used as subjects and they ran four 440 yard dashes per week for two weeks. For one week half of the subjects would be the control which ran with no prior warm-up, and the other half would have warm-up prior to running. The following

week they would reverse their status. Only non athletes were used in the experiment. The warm-up program consisted of (1) one 440 yard lap, (2) six push ups, (3) six leg pulls, (4) ten toe touches, (5) six sit ups, (6) three ten-yard sprints and (7) five to ten minutes of rest before running. No significant difference at the .05 level of confidence was found in any of the times.

DeVries (7) studied thirteen highly skilled competitive swimmers in 1959. The subjects were used to investigate the effects of various warm-ups on the 100 yard dash times. As a passive warm-up, a shower as hot as tolerable was used for six minutes plus massage for ten minutes. For active warm-up the subjects swam 500 yards at their own pace and participated in calisthenics. The tests were the fifty-yard crawl, the breast stroke and the dolphin. The results showed that the 500 yard swim benefitted the entire group, while the massage and shower had no effect. The calisthenics had no effect on the total group but it did slow down the crawl swimmers and speed up the dolphin and breast stroke swimmers. The significant results were at the .05 level of confidence.

Lotter (19) used twenty male students as subjects to study the effects of warm-up on speed of arm movements in 1959. The warm-up periods were of two and four minutes and the subjects were divided into two groups. The subjects would warm up under either condition then perform the test of four minutes of maximum hand cranking on a bicycle

ergometer. After they had performed under one of the warm-up conditions, they would warm up under the second set of conditions and perform the test once again. The warm-up consisted of either two or four minutes of spot running. The results showed no significant difference in either type of warm-up at the .05 level of confidence.

Massey et al (21) used hypnosis to try to control the psychological variable of warm-up in 1961. Fifteen male subjects performed the test of riding a bicycle ergometer 100 revolutions. They were tested twice under both the warm-up condition and the no warm-up condition. Performance was not significantly better at the .05 level of confidence.

Phillips (28) in 1963 studied the influence of warm-up on speed of movement and reaction latency. Seventy-five college males participated in the experiment. The related warm-up was arm exercises which lasted for 2.5 minutes. The heavy non related warm-up consisted of ten minutes of bench stepping. The results showed that neither arm speed nor reaction time was improved by warm-up. These results were obtained at the .05 level of confidence.

Glidewell (11) investigated various warm-up procedures in relation to physical performance. In 1964, twenty-four subjects were used to determine the effect of warm-up on speed of reaction, speed of movement, strength and power of leg muscles. The pre-performance conditions were (1) no warm up, (2) passive warm-up which consisted of twenty

minutes with legs in an electric blanket, (3) cooling which consisted of ten minutes with legs in two ice bags, (4) overload exercises which consisted of exercises while wearing a weighted vest and leg weights. There was no significant difference in scores except when cooling preceded performance and this resulted in significantly lower scores at the .05 level of confidence.

Hutterly (15) in 1967 investigated the effect of varied rest intervals between warm-up and performance. The subjects performed the running of the 440 dash after rest periods of one, four, and ten minutes of rest following warm-up. No significant difference at the .05 level of confidence was found in the scores.

Summary

It would appear that the evidence is inconclusive as to the actual effect of warm-up upon physical performance. The most valid conclusions that may be drawn from this review of literature are that the effects of warm-up depend upon, (1) the type of warm-up used, (2) the length of the warm-up, and (3) the type of activity being tested. The studies that have chosen to investigate the psychological aspect of warm-up have also had conflicting results. (21, 23, 35)

CHAPTER III

PROCEDURE

The purpose of the study was to determine the attitude towards pre-performance activity and the effect this attitude had upon the performance of the fifty-yard dash.

Introduction

The experiment was conducted during the month of May 1972. The subjects were categorized into three groups on the basis of their attitude towards warm-up. These attitudes were obtained by the administration of the Smith-Bozymowski attitude inventory. The inventory was administered prior to any running trials and after the completion of all the running trials. The grouping of the subjects was for analysis of data purposes only. The first administration was used as the criterion for this grouping. The subjects performed the running of the fifty-yard dash a total of four times. There were two performances that were preceded by pre-performance activity and two that were not preceded by pre-performance activity. The average time for each condition was used as the time to be analyzed. The administration of the running schedule of the subjects was arbitrarily selected by the investigator.

Selection of the Attitude Test

The Smith-Bozymowski attitude inventory was selected to be used to determine the attitude towards warm-up. This inventory was constructed in 1965 by Smith and Bozymowski. The inventory was constructed by the Likert technique and consisted of thirty-four questions. There were seventeen negative statements concerning warm-up and seventeen positive statements. Each statement had a choice of five possible responses which could be made by the respondent. He could (1) strongly agree, (2) agree, (3) be undecided, (4) disagree, (5) strongly disagree. The inventory was validated by Flanagan's Index of Discrimination. The reliability coefficient was found to be .94. The questions were given a value according to the response that was made. A value of one indicated a favorable attitude towards warm-up and a value of five indicated an unfavorable attitude towards warm-up. Thus on the extremes, a person with a very favorable attitude could have a possible score of thirty-four and a person with a very unfavorable attitude could have a score of 170. According to Flanagan the highest twenty-six percent of the scores would be the subjects with the most unfavorable attitudes, and the lowest twenty-six percent of the scores would indicate the most favorable attitude towards warm-up. It was this grouping of subjects which was used by the investigator.

Selection of the Subjects

The ninety-one subjects were ninth grade male students

in the required physical education program at Reidsville Junior High School. All boys in the program were invited to take part in the experiment. They were informed that participation would have no effect upon their physical education grade that six weeks. All subjects understood the importance of an accurate measure on the attitude inventory and of an all-out effort on the running of the fifty-yard dash.

Selection of Pre-Performance Activity

The type of pre-performance activity selected by the investigator was of a related - non-related type of warm-up. The investigator arbitrarily selected a two and one-half minute pre-performance activity period since there was no research indicating an optimum time for a warm-up to occur; any greater length of time might begin to produce a fatiguing effect. The pre-performance exercises consisted of thirty seconds of jumping jacks, thirty seconds of jogging in place, one minute of ten-yards sprint running, and thirty seconds of alternate hand-foot toe touches.

Selection of the Fifty-Yard Dash

The fifty-yard dash was selected because the investigator desired to study the effect of warm-up on a power type activity. The fifty-yard dash is an appropriate instrument to measure power. It was also decided that a distance greater than fifty yards would begin to require some conditioning and a training effect might

occur during the course of the experiment.

Selection of Performance Sequence

There were five class periods involved in the investigation with a total beginning participation of 182 subjects. Due to absentees and decisions not to participate, the final number of subjects with a complete set of scores was ninety-one. The sequence of pre-performance conditions under which the subjects would run was arbitrarily chosen by the investigator. The first and fourth periods ran with warm-up on trials two and four, and without warm-up on trials one and three. The third, fifth, and sixth periods ran with warm-up on trials one and three and without warm-up on trials two and four. No subject was allowed to run more than once within a twenty-four hour period.

Selection of Analysis Techniques

The data were examined two different ways. First, a two-way analysis of variance was used to determine if a significant difference existed due to pre-performance activity, or if a significant difference existed due to attitude toward pre-performance activity, or if a significant difference existed due to the interaction of these two variables. Second, a t test was used to determine if there was a significant change in attitude towards warm-up during the course of the experiment. A t test was also conducted for each individual attitude group to determine if within that group there was a significant difference in

performance due to pre-performance activity.

Administration of the Attitude Test

After obtaining clearance with the school authorities, the investigator began his administrative procedures. The administration of the attitude test was conducted on the first day of the experiment. The investigator met with each physical education class at the appropriate period. The investigator explained the general nature of the experiment and the demands that would be made upon each subject if he decided to participate. The demands consisted of: (1) taking the attitude test twice, (2) running four fifty-yard dashes. The investigator made it explicitly clear that all participation was voluntary, and no one should participate unless they would give the investigator accurate measures on the attitude test and on fifty-yard dash time. The time to take the attitude test varied from eight to fifteen minutes with the average time being about twelve minutes. Prior to actually taking the test, the investigator carefully read and explained the instructions, the sample questions and the choice of responses. A few words in the body of test that the investigator thought might be confusing were clarified. Questions from the subjects were then answered. When all the preliminary details were completed, the subjects took the test and upon completion returned their papers to the investigator with their name and class period on them.

Administration of the Pre-Performance Activity

The pre-performance activity consisted of two and one-half minutes of exercises. The first exercise consisted of thirty seconds of jumping jacks. The investigator counted cadence and kept time with a stop watch. The second exercise consisted of thirty seconds of right-hand - left-toe touches for which the investigator counted cadence and kept time with a stop watch. The third exercise consisted of running in place at a moderate rate for thirty seconds. The investigator controlled the pace by observation. If a subject was observed to be jogging much slower or much faster than the majority of the subjects, he was asked to either speed up or slow down. The fourth exercise consisted of one minute of ten-yard sprints. This was accomplished by having the subjects line up and sprint ten-yard intervals for a total time of one minute. The investigator by observation tried to insure that all subjects were giving an "all out" effort. If a subject was observed to be giving less than an "all out" effort, he was asked to speed up his sprinting speed. The investigator had to make very few such comments during the course of the experiment.

Administration of the Fifty-Yard Dash

The running of the fifty-yard dash was carried out on days two through five of the experiment. A fifty-yard distance was measured on the athletic field and marked off with lime. The runners were started by the instructor of the class. The investigator timed runs and recorded the results

at the finish line. The subjects were allowed to wear any type of shoe or run without shoes. The only stipulation was that they run with the same equipment each day. This also applied to the starting stance. The participants were allowed to use any stance provided it was used for all trials. All the participants were observed to run to the best of their ability during all trials. All scores were recorded to the nearest tenth of a second.

Administration of Analysis Techniques

Scores for both attitude tests and all dashes were recorded beside the participant's name. The subjects were then classified as having either favorable, unfavorable or undecided attitudes towards warm-up. The highest twenty-six percent of the scores (twenty-three subjects) were considered to have unfavorable attitudes towards warm-up. The lowest twenty-six percent of the scores (twenty-three subjects) were considered to have favorable attitudes towards warm-up. The remainder of the subjects were considered to have an undecided attitude towards warm-up.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this study was to determine the attitude towards pre-performance activity and the effect this attitude had upon the performance of the fifty-yard dash. All subjects were classified as having either a favorable, unfavorable, or undecided attitude towards warm-up. The two-way analysis of variance and t test were the statistical techniques used for the analysis of data.

PRESENTATION OF DATA

Between Conditions

Scores obtained on the performance of the fifty-yard dash were examined using a two-way analysis of variance. Considering the variable of pre-performance exercise the results showed no significant difference in performance of all the subjects when the dash was preceded by warm-up or not preceded by warm-up. The obtained F was .23 and the critical F at the .05 level of confidence was 3.12. The null hypothesis that there is no significant difference in the performance of the fifty-yard dash when preceded by warm-up or when preceded by no warm-up was not rejected. (Table 1)

Between Attitudes

Scores obtained on the performance of the fifty-yard dash were examined using a two-way analysis of variance Considering the variable of attitude towards pre-performance activity, the results show a significant difference in the performance of subjects who had a favorable attitude, those with an unfavorable attitude, and those with an undecided attitude. The obtained F was 6.98 and the critical F at the .05 level of confidence was 3.12. The null hypothesis that there is no difference among subjects with either favorable, unfavorable or undecided attitudes towards pre-performance exercise on fifty-yard dash time was rejected. The subjects with favorable attitudes performed significantly better at the .05 level than the subjects with unfavorable or undecided attitudes. (Table 1)

Between the Interaction of Attitudes and Conditions

The scores obtained on the performance of the fifty-yard dash were examined using a two-way analysis of variance. Considering the interaction of the two variables, the results show no significant difference among any of these groups of scores: favorable attitudes and warm-up, favorable attitudes and no warm-up, unfavorable attitudes and warm-up, unfavorable attitudes and no warm-up, undecided attitudes and warm-up, undecided attitudes and no warm-up. The obtained F was .07 and the critical F at the .05 level of confidence was 3.12. The null hypothesis that there is

TABLE 1

TWO-WAY ANALYSIS OF VARIANCE

Source	Sum of Squares	df	Mean Square	F
Between Conditions	.25	1	.25	.23
Between Attitudes**	15.21	2	7.61	6.98*
Interaction	.16	2	.08	.07
Residual	93.08	85	1.09	
Total	108.7	90		

* Significant at the .05 level of confidence

3.12 = significant "F"

** The Scheffe' Tests failed to indicate the difference among the three attitude groups on the performance of the fifty-yard dash. The investigator conducted t tests to ascertain the location of the exact differences. The group with favorable attitudes were found to have performed significantly better than the groups with unfavorable or undecided attitude. The calculated t values were 2.15 and 2.07 respectively. The critical t value at the .05 level of confidence was 1.98. There was no significant difference found between the undecided group and the unfavorable group. The obtained t value was .41 and the critical t value at the .05 level of confidence was 1.98.

TABLE 2

t TEST - FIRST AND SECOND ATTITUDE TEST

	Mean	df	t
First Test	72.3	90	2.63*
Second Test	79.4		

TABLE 3

PRE-PERFORMANCE SCORES

FOR INDIVIDUAL GROUPS

	Favorable	df	t
Warm-up	6.81	25	3.68*
No Warm-up	6.91		
	Unfavorable		
Warm-up	7.019	25	1.735
No Warm-up	7.115		
	Undecided		
Warm-up	6.98	38	2.78*
No Warm-up	7.08		

* Significant at the .05 level of confidence

2.056 = significant t for N = 26

2.021 = significant t for N = 39

no significant difference on the performance of the fifty-yard dash among subjects with favorable attitudes and no warm-up, favorable attitudes and warm-up, unfavorable attitudes and warm-up, unfavorable attitudes and no warm-up, undecided attitudes and warm-up, undecided attitudes and no warm-up was not rejected. (Table 1)

Between First Attitude Test and Second Attitude Test

Scores on the two attitude tests were examined using the t test. The results showed a significant difference in the scores of the two tests. The obtained t was 2.63 and the significant t at the .05 level of confidence was 1.98. The null hypothesis that there is no difference between the scores on the first attitude test and the scores of the second attitude test was rejected. (Table 2)

Between Conditions Within Each Attitude Group

Division of the scores was obtained by grouping the subjects in favorable, unfavorable, and undecided attitudes towards pre-performance activity. The scores on fifty-yard dash times were analyzed according to performance which was preceded by warm-up and performance which was not preceded by warm-up for each of the three groups. A t test was used for the analysis of data. The results of the analysis on the group with favorable attitudes towards warm-up showed a significant difference in their performance when allowed to warm up. The obtained t was 3.68 and the critical t at the .05 level of confidence was 2.056. (Table 3)

The results of the analysis on the group with unfavorable attitudes show no significant difference in their scores. The obtained t was 1.735 and the critical t value at the .05 level of confidence was 2.056.(Table 3) The results of the analysis of data for the group that had undecided attitude towards pre-performance activity showed a significant difference in fifty-yard dash time when allowed to warm up. The obtained t was 2.78 and the critical t at the .05 level of confidence was 2.021. (Table 3)

Discussion

Many studies have been conducted on the subject of pre-performance activity (warm-up). The results of this study agree in part with some of the previous studies. When considering only the variable of pre-performance activity, the results of this study show no significant difference between trials preceded by warm-up and trials not preceded by warm-up. Previous studies have reached the same conclusions. (7,11,13,14,15,17,19,21,22,28,33,34)

Other studies are in disagreement having found a beneficial significance due to pre-performance activity. (1,3,4,12,20,23,24,26,27,29,30,31,35,36) Many of these studies used only a few subjects. It is possible that individual differences may have not been sufficiently substantiated. Some of the studies used an endurance type of activity as the measuring instrument, while the instrument used in the author's experiment was a power type activity.

Some few studies are in disagreement having found pre-performance activity to be detrimental to performance. (10,32) One of the studies (10) used a pre-performance activity which was quite strenuous in nature. The other study used a type of pre-performance (short wave diathermy) which was very different from the one used in the author's study.

The results of the study show that the subjects with favorable attitudes scored significantly better on the fifty-yard dash than did the subjects with unfavorable or undecided attitudes. This finding would indicate that further study is needed. The author can only surmise that possibly the subjects with favorable attitudes were also the subjects with previous athletic experiences. This fact might have been an advantage to this group.

The results also show that the groups with favorable and undecided attitudes performed significantly better when they were allowed to warm up. The psychological variable is very important in this finding. The participants with favorable attitudes believed that warm-up was necessary for a good performance. Therefore when warm-up was denied, performance suffered, and when warm-up was allowed, performance was improved. When considering the group with undecided attitudes, there is no explanation as to why this group performed better when allowed to warm up.

The results of the study also show that attitude towards warm-up became more unfavorable as the study

progressed. There was a significant difference between the first attitude test and the second one in the direction of an unfavorable attitude. The author offers personal observation for the possible explanation of this finding. From the comments of the subjects, it was discerned that the participants were not accustomed to any pre-performance activity. Even though the activity was only 2.5 minutes in duration, many of the subjects commented that the exercise was too strenuous and too taxing.

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS FOR FURTHER STUDY

The purpose of this study was to determine the attitudes towards pre-performance activity and the effect these attitudes had upon the performance of running the fifty-yard dash. All subjects were classified as having either favorable, unfavorable, or undecided attitudes towards pre-performance activity by the Smith-Bozymowski attitude inventory. All subjects performed the running of the fifty-yard dash four times: twice with warm-up preceding the running and twice with no warm-up preceding the running.

The subjects consisted of the population of ninth grade males at Reidsville Junior High. The participants were involved in six days of testing. Two days involved attitude testing, two days involved the administration of the fifty-yard dash using warm-up, and two days involved the administration of the fifty-yard dash using no warm-up. The results were analyzed using the Analysis of Variance and the t test considering both the pre-performance variable of warm-up versus no warm-up and the attitude variable.

Summary of Results

1. There was no difference in the performance of the fifty-

yard dash due to pre-performance exercise when considering the group as a whole.

2. The group with favorable attitudes towards pre-performance exercise performed significantly better when they were allowed to warm up than did the undecided group.

3. The group with favorable attitudes towards pre-performance exercise performed significantly better when they were not allowed to warm up than did the undecided group.

4. The group with favorable attitudes towards pre-performance exercise performed significantly better when they were not allowed to warm up than did the group with unfavorable attitudes towards warm-up.

5. The group with favorable attitudes towards pre-performance exercise performed significantly better when they were allowed to warm up than did those with unfavorable attitudes towards pre-performance exercise. These results considered both pre-performance conditions.

6. The group with favorable attitudes performed better when they were allowed to warm up.

7. The group with undecided attitudes performed significantly better when they were allowed to warm up.

8. There was no significant difference in the performance of the group with unfavorable attitudes when analyzing the results according to warm-up and no warm-up.

9. There was a significant change in the attitudes of the

subjects in the direction of a more unfavorable attitude towards pre-performance exercise.

Conclusions

There was no difference in the performance of the fifty-yard dash when considering the variable of pre-performance exercise and considering the subjects in a complete group. When analyzed according to attitude, it was found that the groups with favorable and undecided attitudes performed significantly better when they were allowed to warm up as opposed to when they were not allowed to warm up. There was a change in attitudes of subjects toward a more unfavorable attitude towards pre-performance exercise during the course of the experiment.

The findings and conclusions of this experiment were in agreement with some of the past studies and disagreement with others. When considering the effect of pre-performance exercise upon the performance of an activity, the results of this investigation agree with thirty-five percent of the previous studies conducted on the subject of warm-up. These were the studies that indicated no significant difference due to warm-up.

Of all the previous studies conducted on the topic of warm-up, only three attempted to investigate the psychological variable in warm-up. Only one of these studies studies has attempted to measure this variable. This was a study conducted by Smith and Bozymowski in 1965. They

found that subjects with a favorable attitude towards warm-up performed significantly better when allowed to warm up. The results of the investigation reported in this paper agree in part with the results of the Smith-Bozymowski study.

Implications for Further Research

In planning further study on the effect of attitude toward pre-performance exercise, it is suggested that an attitude inventory be developed for the particular age and sex group being tested. It is suggested that studies with this basic format be conducted with other age and sex groups. It may be advantageous to either increase or reduce the length of the warm-up procedure or alter the type of warm-up used.

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APPENDIX A

Directions

You will answer each question with what you think is the best response. You will have 5 choices ranging from (1) strongly agree, (2) agree, (3) undecided, (4) disagree, (5) strongly disagree.

Mark all answers on the Answer Sheet.

Example: I like Physical Education.

(1) (2) (3) (4) (5)

The response #2 would indicate you agree with the statements. If you really like physical education more than any other subject you might have put #1 (x) strongly agree. If you did not like physical education, or if you really despised it, you may have marked #4 or #5. Please do not mark #3 undecided unless you do not have any feeling at all about the question.

SMITH-BOZYMOWSKI ATTITUDE INVENTORY

1. Warm-ups should not be used before strenuous activity because they tire you out.
2. I believe that warming up is indispensable for good performance.
3. Warm-ups are needed before activity.
4. I do not believe that warm-ups would affect the distance I could throw a softball.
5. There is no reason to warm-up before playing badminton.
6. I believe that it is important for our intramural teams to warm-up before the game starts.
7. I do not care whether or not I warm-up before activity.
8. I don't feel that I am ready to participate in active sports unless I have warmed up.
9. I would only warm up before playing in a game if I were stiff and sore.
10. Other people may need warm-ups but I do not.
11. I would not do warm-ups before playing in a game unless told to do them.
12. I can think of no good reason for warming up before a hockey game.
13. I don't think that I could play my best unless I warmed up.
14. Warm-ups continue to be a traditional part of the physical education program even though they are unnecessary.
15. I feel that after warming up I am capable of running faster.
16. Before entering physical activity, both the professional and amateur athlete needs to warm up.
17. Warm-ups have no value in the physical education classes.

18. I am more likely to get muscle cramps if I do not warm up before playing hard.

19. I think warm-ups improve endurance.

20. Warm-ups in physical education classes are a waste of time.

21. I would not attempt to throw a ball as hard as I could without first warming up.

22. If I were a physical education teacher, I would not have my classes do warm-ups.

23. I do not believe that a warm-up period should be any longer than two minutes.

24. If I were in top physical condition, I would not have to warm up before playing hard.

25. I feel more confident of my athletic ability after I have warmed up.

26. Warm-ups should be used before activity only on cold days.

27. By doing warm-ups your muscles gradually adjust to vigorous activity.

28. My movements seem to be more coordinated after I have warmed up.

29. College boys do not have to warm up as much before activity as high school boys.

30. I like to warm up because it helps "loosen up" my muscles.

31. If given the choice, I would elect to warm up before activity.

32. Injuries are less likely to occur if warm-ups precede strenuous activity.

33. I feel warm-ups are necessary because they help relax my muscles so I can play better.

34. I don't feel I need to warm up if I have played hard the day before.

APPENDIX B

RAW SCORES

First Written		Warm-up	No Warm-up	Warm up	No Warm-up	Second Written
*1.	90	7.0	6.8	6.7	6.9	92
2.	91	8.5	8.3	8.1	9.0	94
3.	71	8.2	8.7	8.1	8.3	118
4.	97	8.4	8.2	8.1	8.2	124
5.	74	7.2	6.8	6.9	7.1	56
6.	97	6.8	6.8	6.9	7.3	105
7.	77	7.4	7.2	7.3	7.7	88
8.	84	7.5	7.2	7.5	7.5	102
9.	66	6.5	6.9	6.5	7.0	109
10.	83	7.8	7.7	7.7	7.2	99
11.	77	6.0	6.4	6.7	6.5	147
12.	64	6.9	6.8	7.0	7.0	57
13.	99	8.0	7.2	7.2	7.2	74
14.	71	7.5	7.1	7.3	7.3	74
15.	34	6.8	6.7	6.7	7.2	36
16.	58	6.3	6.8	6.7	6.3	40
17.	54	7.4	7.2	6.8	7.0	73
18.	75	7.1	7.6	7.2	6.9	98
19.	76	7.3	8.2	7.5	7.3	86
20.	75	6.5	7.0	6.7	6.8	96
21.	72	7.2	7.8	7.7	7.3	99
22.	89	6.4	6.5	6.7	6.4	96
23.	50	7.2	7.4	7.1	7.4	51
24.	78	6.5	6.4	6.5	6.2	95
25.	52	6.7	7.2	6.7	6.4	82
26.	57	6.8	7.2	7.1	6.7	78
27.	63	6.8	7.2	6.8	7.0	48
28.	99	6.8	7.0	6.7	6.5	102
29.	50	6.8	6.9	6.7	7.0	79
30.	53	7.0	7.2	7.2	6.9	45
31.	68	7.2	7.8	7.4	7.7	102
32.	93	7.0	6.7	7.1	7.0	105
33.	66	7.0	7.4	7.7	7.3	65
34.	54	6.5	6.8	6.7	6.8	49
35.	106	6.7	6.8	6.9	6.7	100
36.	70	6.6	7.0	6.5	6.3	84
37.	100	6.2	7.5	6.6	6.1	105
38.	100	8.4	7.8	7.9	8.0	93
39.	62	6.0	6.0	6.2	6.2	89
40.	64	7.7	7.8	7.8	7.9	37
41.	64	7.9	8.2	7.4	8.1	87
42.	53	6.2	6.4	6.2	6.4	85

RAW SCORES (continued)

	First Written	Warm-up	No Warm-up	Warm-up	No Warm-up	Second Written
43.	75	7.2	7.2	7.7	7.4	79
44.	80	7.0	6.7	6.4	6.6	87
45.	65	6.8	6.2	6.2	6.5	56
46.	48	6.2	6.0	6.2	6.2	76
47.	42	6.0	6.0	6.0	6.0	67
48.	90	6.2	6.7	6.2	6.7	96
49.	62	7.7	8.0	8.4	8.2	56
50.	92	7.0	6.8	7.0	7.0	92
51.	42	8.0	7.7	7.4	7.8	38
52.	72	6.8	7.1	6.8	6.9	66
53.	95	6.0	6.2	6.2	6.3	84
54.	91	6.3	6.5	6.1	6.3	94
55.	69	8.0	7.7	7.3	7.3	50
56.	99	7.3	7.7	6.9	7.1	102
57.	74	6.8	7.4	8.2	7.0	84
58.	48	6.7	7.1	6.2	6.5	45
59.	94	7.0	7.0	7.7	7.5	99
60.	77	6.8	6.8	6.9	6.7	80
61.	74	6.4	7.3	6.9	6.9	69
62.	58	7.0	6.3	7.2	6.9	71
63.	60	6.7	7.2	6.7	6.9	58
64.	60	6.2	6.5	6.3	6.2	72
65.	74	6.8	7.2	7.0	6.7	78
66.	50	6.3	6.8	6.2	6.2	70
67.	87	6.8	7.5	6.9	7.1	103
68.	98	7.0	7.9	7.3	7.5	103
69.	103	6.1	6.9	6.6	6.5	121
70.	70	5.9	6.1	6.3	6.2	75
71.	54	7.7	7.7	7.7	7.7	57
72.	76	6.3	6.3	6.4	6.7	78
73.	68	7.0	6.9	6.6	6.8	68
74.	81	6.3	6.5	6.2	6.7	83
75.	68	6.2	6.1	6.2	6.3	75
76.	61	9.9	9.7	9.2	9.7	85
77.	74	7.3	7.0	6.9	7.3	75
78.	82	7.7	7.7	7.6	8.3	89
79.	95	6.9	7.1	6.7	6.4	118
80.	64	7.8	7.7	7.5	7.7	74
81.	81	6.4	6.7	6.7	6.7	58
82.	62	7.0	7.0	6.9	7.1	51
83.	59	6.1	6.0	6.0	6.0	77
84.	102	6.7	6.9	6.7	7.0	75
85.	61	6.1	6.2	6.0	6.1	69
86.	61	6.3	6.5	6.4	6.5	74
87.	58	7.1	6.7	6.4	6.5	54

RAW SCORES (continued)

First Written		Warm-up	No Warm-up	Warm-up	No Warm-up	Second Written
88.	60	7.2	7.0	7.0	7.4	81
89.	64	6.7	6.7	6.7	6.7	49
90.	65	6.2	6.4	6.4	6.7	70
91.	63	7.1	7.1	7.1	7.3	53
M		72.3				79.4

Total Mean for Warm-up = 6.95
Total Mean for No Warm-up = 7.03

*The scores on the written tests are in units of points with the highest possible point total being 170 and the lowest being 34. The dash times for the warm-up and the no warm-up trials are recorded to the nearest tenth of a second.